

Studies of ^{235}U by Coulomb Excitation: High Spin.

D.Ward¹, R.M.Diamond¹, R.M.Clark¹, M.Cromaz¹, M.A.Deleplanque¹,
P.Fallon¹, A.Goergen¹, G.J.Lane², I.Y.Lee¹, A.O.Macchiavelli¹,
F.S.Stephens¹, C.E.Svensson³ and K.Vetter⁴

¹ Nuclear Science Division, Lawrence Berkeley National Laboratory

² Department of Nuclear Physics, Australian National University, Canberra, Australia

³ University of Guelph, Guelph, Ontario, Canada.

⁴ Lawrence Livermore National Laboratory, Livermore.

The spectroscopy of ^{235}U has hardly been extended since the work of Stephens et.al.[1]. Since techniques have been advanced considerably in the meantime, we decided to revisit this most important nucleus. A motivation for the original work was to identify, and to measure the properties of the $j_{15/2}$ multiplet with a view to performing a complete Coriolis analysis. This remained a motivation for the present work, and we were also interested in exciting the bands to higher spin.

The first experiments were performed with Gammasphere and with beams of ^{86}Kr , and ^{136}Xe . However, the background from fusion reactions on light contaminants in the target proved unsurmountable. γ - γ coincidence techniques work poorly at low spins in ^{235}U ; these states decay by one-step transitions to low-lying states of the ground band whose subsequent decays are largely converted. Fusion reactions with light contaminants in the target produce floods of high γ -ray-multiplicity cascades. Therefore, γ - γ coincidences make invisible the interesting transitions, whilst enhancing the background. In those experiments, even the high-spin states were obscured by background.

The 8PI Spectrometer at the 88" Cyclotron had a superior performance in measuring the total energy H, and gamma-ray multiplicity K in association with γ - γ coincidences. With the 8PI Spectrometer the fusion background was greatly suppressed by gating on low H and K. The level scheme shown in Fig 1 was obtained in these experiments. Although we were not able to say anything new about the $j_{15/2}$ multiplet a remarkable feature of the data is the strong Coulomb excitation of positive-parity levels. Comparison with a standard Winther-DeBoer code in-

dicated B(E3)-values of approximately 10-15 spu., which is surprisingly high for simple Nilsson states. Because the γ -coincidence gating conditions made a quantitative analysis difficult, we have continued this aspect of the experiment in γ -ray singles as discussed in the companion report.

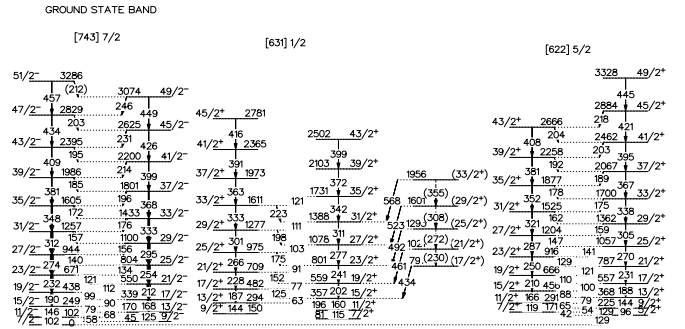


Figure 1: Level scheme for ^{235}U derived in this work. Band-heads were previously known.

References

- [1] F.S.Stephens, M.D.Holtz, R.M.Diamond, and J.O.Newton. Nucl Phys. A115 (1968) 129.